Greenhouse Gas Inventorying and Mitigation at Penn State University

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Introduction

- Research Context for Campus-Level Work
- Environmental Context for GHG Work
- GHG Inventory
  - 1997
  - 1990 & Current
- Mitigation
  - Current Efforts
  - Future Directions

Research Context

- Center for Integrated Regional Assessment (CIRA) GHG Initiative
  - Cross-scale GHG inventories and mitigation action plans
- Human-Environment Regional Observatories (HERO)
  - Develop infrastructure
    - Protocols
    - Cross-site collaboration
      - “Meta-Protocols”
      - Collaboratory

Penn State Environmental Context

- Environmental Stewardship
- The responsibility of Penn State to manage its operations with proper regard to environmental consequences and to the rights of others
- Moving toward environmentally sustainable behavior
- Current focus on no-regrets and/or low-cost

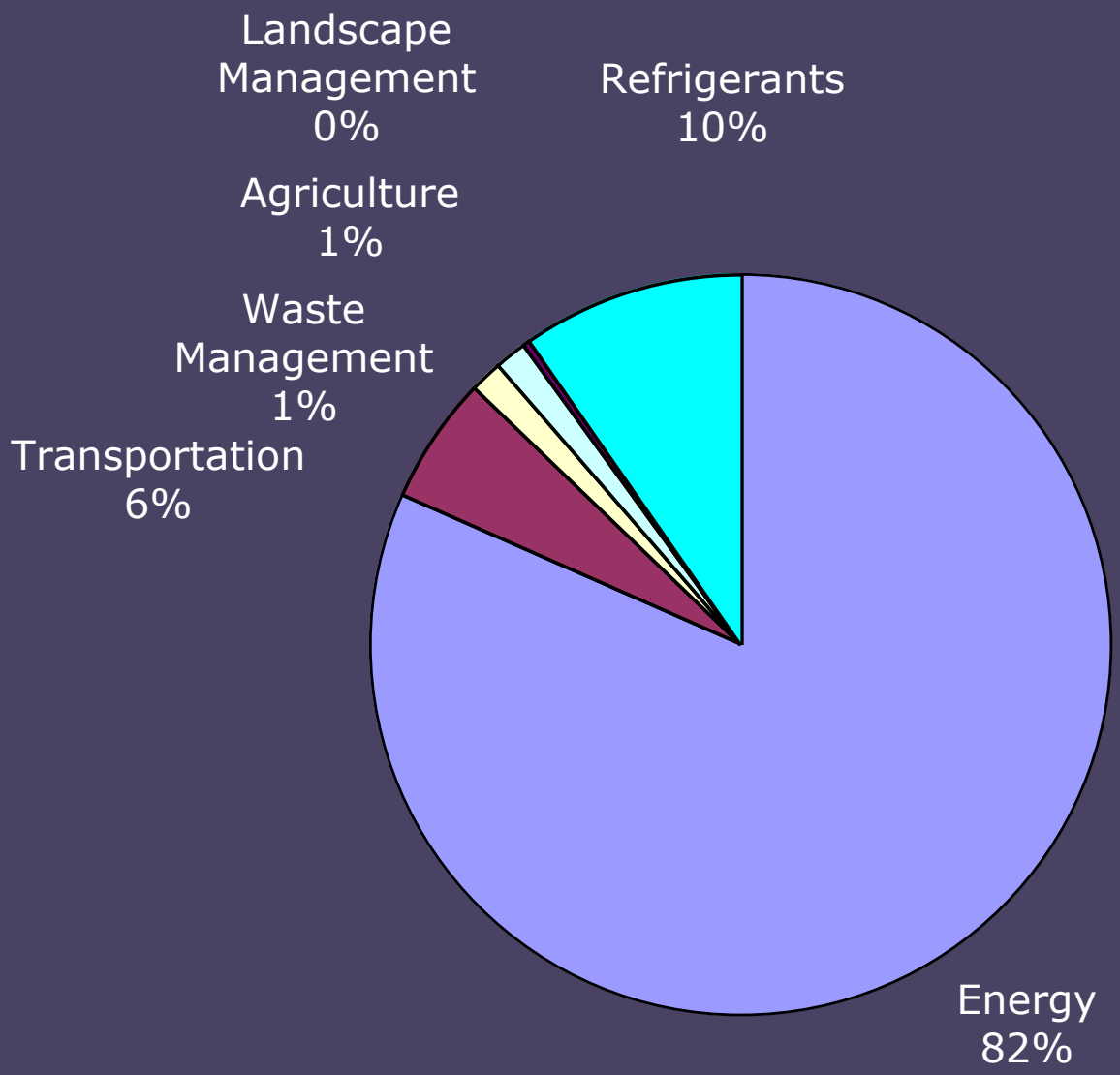
Strategy Focus Areas

- Purchasing
- Conserve energy and water
- Minimize solid waste
- Minimize toxic material use and hazardous waste
- Planning and design
- Regulatory compliance

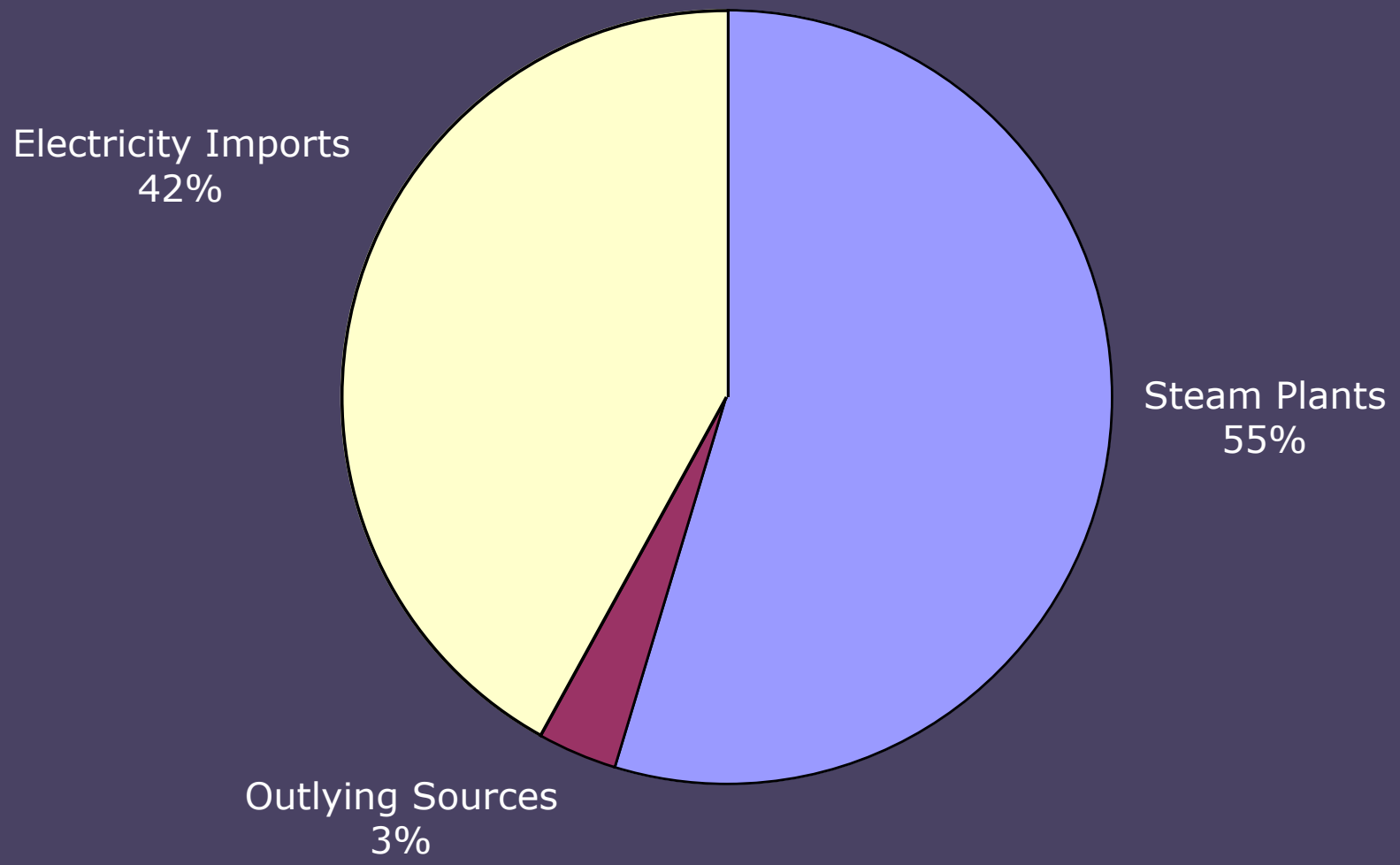
GHG Inventories

- 1997 inventory completed during GCLP project by Steve Lachman
- Approached by Office of Physical Plant to do 1990 and 2000
  - Inform mitigation action plan
  - Contextualize ongoing efforts to reduce emissions

1997 GHG Emissions



1997 Energy Emissions



1990 & Current Inventory

Q: Why do local Inventories?

A: To inform mitigation action plans

- Three approaches:
  - Geographically based
  - Consumption based
  - Agency based
- Agency based approach
  - Informs mitigation action plans
  - Requires very specific local data

1990 & Current Inventory

- Point Sources
  - Buildings
  - Other Facilities
  - Energy Generation
- Transportation
  - Previous inventory based on regional average commute
  - Specific data available for all parking permit holders

Mitigation Efforts

- Current Efforts
  - Energy
  - Transportation
- Future Directions

Energy Mitigation Efforts

- Energy efficiency
  - Buildings
    - Recommissioning
      - Total costs $780,000
      - Annual savings $219,000
      - Simple payback 3.61 years
    - Commissioning new buildings
      - ASHRAE Standards
  - Water
    - Water savings
    - Also reduces sewage

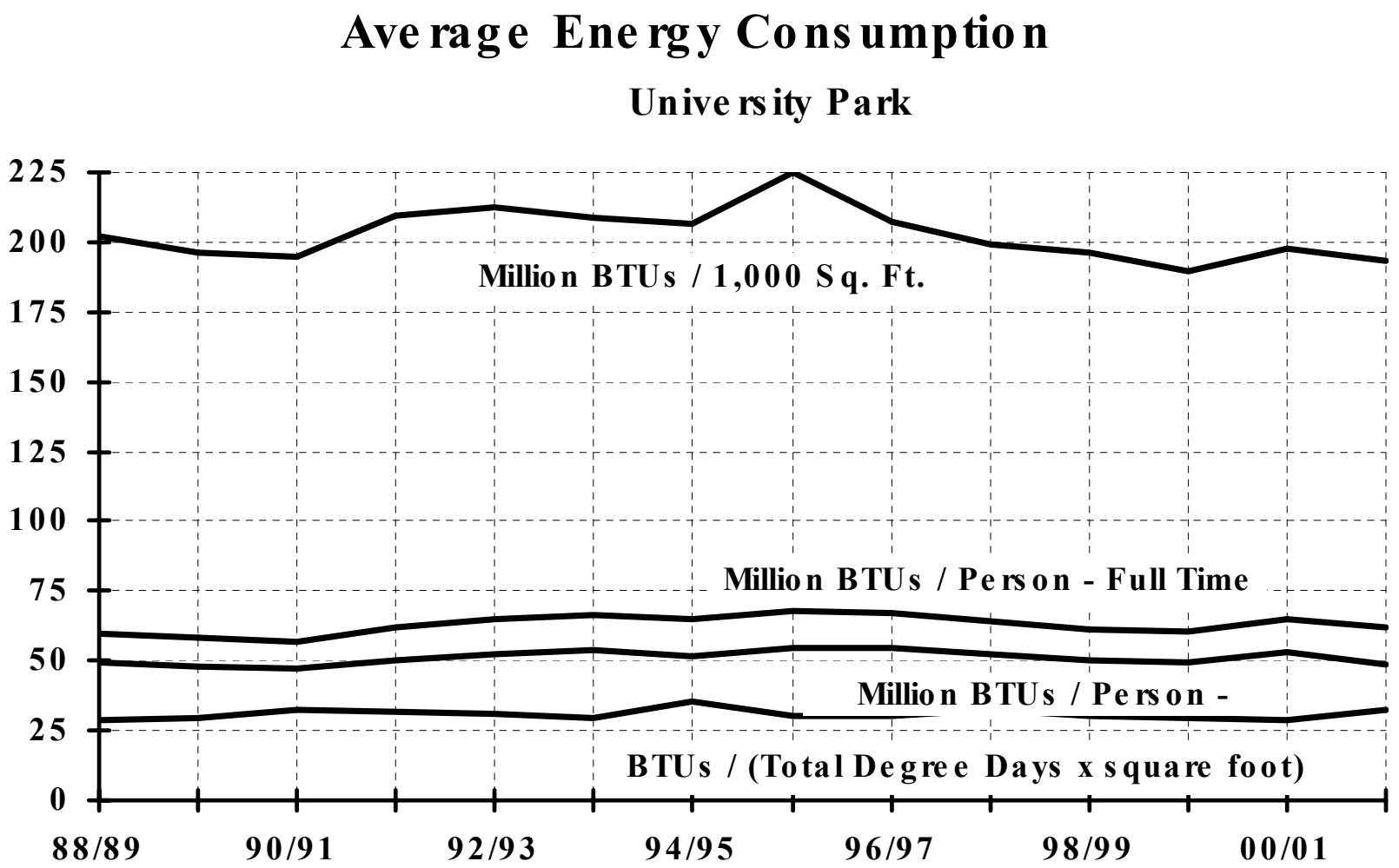
Energy Mitigation Efforts

- Green Energy
  - 5% of electricity from wind power (through offsets)
  - $0.014/kWh premium for wind power
  - Annual purchased electric costs $18,807,000
  - Cost of wind power $246,400
  - 1.3% of cost

Energy Star Purchasing

- Most electronic equipment is already energy star rated so there is no price differential
- Financial incentive
  - Purchased 930 refrigerators/microwaves
    - Low bid $344 cheaper but not Energy Star rated.
    - Buying second bidder's Energy Star rated equipment would save $6273 a year in electricity
    - Bought the Energy Star product
- Computers
  - More LCD Screens
  - Activate Energy Star Features

Energy Consumption



Transportation Mitigation Efforts

- Bus Passes
  - Must surrender parking pass
  - Small number of one-day passes permitted
  - Reduce demand for parking, minimize new lot construction
- Free Ridership
  - Campus and Town Loops, Link Service
  - Possibility of free ridership on entire system, but complicated

Future Directions

- Develop mitigation action plan specifically for GHGs based on inventories
- Promote alternative energy sources
  - New wind turbine development
  - Fuel-cell development
- Buildings
- Must be cost-effective